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SOUTHERN PINE BEETLE EPIDEMIC IN HONDURAS

APPRAISAL AND RECOMMENDATIONS

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by

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ABSTRACT

In January 1964, the Forest Service of the U. S. Department of Agriculture responded to a request by the Agency for International Development to investigate a bark beetle epidemic in the pine stands of Honduras by sending two entomologists there to study the problem and advise on the feasibility of containment and control. In the ensuing two months, a worsening beetle situation prompted AID to request the Forest Service to send another team of experts to Honduras to further study the problem and advise on possible solution. The latter team spent 3 weeks studying the problem and developing information on possibilities for containment. They concluded that the scope and severity of the epidemic precluded successful control by the felling and spraying of infested trees, but that the virulence of the epidemic could be slowed, and the rate of tree-killing reduced by large-scale salvage of infested

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trees, supplemented as needed by felling and spraying practices. They also concluded that a substantial pine resource, capable of supporting a major forest industry, remains in Honduras and that there is ample opportunity for forest products industry in the country.

SUMMARY OF RECOMMENDATIONS

A. The Government of Honduras should negotiate immediately with sawmills to salvage all infested trees in Zones B, C, and D (fig. 1--inside back cover).

Sawmill owners should agree to:

(1) Give to the Government 30 percent of sawn lumber of lowest grades.

(2) Build Government-designated logging spur roads, as needed, to remove infested timber.

(3) Deck and water spray logs that cannot promptly be converted to lumber.

Government should agree to:

(1) Waive public stumpage fees and municipal charges (in return for the 30 percent of sawn lumber from sawmills).

(2) Guarantee a minimum of 452 cubic meters of wood, including the volume of infested timber logged, for each 1.6 kilometers of road constructed.

(3) Provide an average of one fully equipped brigade for each cooperating sawmill to fell and spray infested trees not salvaged, and to assist in the administration of the agreements negotiated with the sawmill owners.

(4) Establish storage yards to season and stock sawn lumber received from sawmills.

(5) Guard storage yards to prevent pilferage or other loss of sawn lumber.

B. The following modifications should be made in the deployment of brigades currently engaged in combating the epidemic:

(1) Assign fully equipped brigades to fell and spray infested trees along the front edge of the infestation. (Estimated need - 25 brigades).

(2) Assign an average of one fully equipped brigade to each cooperating sawmill to (a) fell and spray infested trees not salvaged, (b) locate spot infestations for salvage, and (c) assist in the administration of agreements negotiated with the sawmill owners.

C. The Government of Honduras should greatly expand its forestry program. Component parts of such a program should include the following:

(1) Extend a forest fire protection program to all areas of high fire hazard, with priority to beetle-affected areas.

(2) Expand the national Forest Service.

(3) Expand wood utilization possibilities by attracting foreign capital for the development of forest products processing industries.

(4) Establish a library center of forest literature for use by research and management.

(5) Initiate studies of forest product industry potentials, such as:

(a) Economic study to determine number, location, production, and markets for each wood-using industry.

(b) Marketing study of imports and exports of wood-based products to determine needs of new wood-using industries.

(c) Feasibility study of needed roads for access to timber stands and to permit low-cost transport of wood products to market or to ports.

(6) Inventory pine and hardwood resources and determine most suitable industry dependence on such resources.

Specific suggestions are made to AID to advise and assist in the forestry program. Its role will be coordinated with and complementary to FAO and the German bilateral forestry projects.

D. The estimated percentage of pine volume killed by the southern pine beetle in Zone A (fig. 1) cannot be assumed as a true experience pattern in Zones B, C, and D. It is recommended, therefore, that decision on location and capacity of a pulp and paper mill be withheld until the epidemic subsides.

INTRODUCTION

Early in January 1964, the Agency for International Development requested the Forest Service, U. S. Department of Agriculture, to provide expert assistance to the Government of Honduras in appraising a virulent and widescale epidemic of pine bark beetles, and recommending means of

containment and control. In response to this request, David E. Ketcham and William H. Bennett, entomologists at Forest Service offices in Alexandria, La., were sent to Honduras in early February. With assistance from FAO foresters and Honduran entomologists, Ketcham and Bennett promptly accomplished their mission, prepared a preliminary report on their findings, and returned to the United States. A final report in English and Spanish, together with a suggested plan for containment and control, was issued the following month.

By early April, the virulence of the epidemic increased and matters worsened as efforts by the Honduras Government, assisted by FAO foresters, failed to lessen the rate of tree-killing and spread. As a result, Honduran officials urgently requested more help from the United States in the form of supplies, insecticides, power saws, and helicopters to transport men and materials. In turn, AID asked Forest Service to send another team to Honduras to reassess the situation and suggest additional measures to cope with the worsening problem. Thereupon, Gordon D. Fox, Associate Deputy Chief of the Forest Service, selected a party of experts with long experience in research, surveys, and control of bark beetles, and in logging, milling, and wood utilization to accompany him in reappraising the problem in Honduras. The party included James A. Beal, Walton R. Smith, Jack W. Bongberg, Maxwell D. Becker, and the aerial and ground survey team of Hoover Lambert and Donald Wilmore, both of the U. S. Forest Service.

The American mission spent three weeks in Honduras studying the problem and, by intensive aerial and ground surveys, developed detailed information on the scope and virulence of the epidemic. Members of the team also visited the major sawmills and wood-using plants in the country, seeking and compiling information from industry, Government officials, and others of materials and methods best suited for coping with the problem. The facts and figures developed from all sources constitute the body of this report.

Appreciation is expressed to officials of the Honduran Government, U. S. Ambassador and Staff, AID Mission, FAO Foresters, U. S. Air Force Mission, Bilateral German Fire Control Mission, and others for their fine cooperation and assistance throughout the period of this study. Special attention is directed to the splendid efforts of the Honduran Government in the campaign to combat the beetle infestation. Without its demonstrated desire and ability to plan, organize, and carry out the control work, recommendations in the report for coping with the problem would not be feasible. The recommendations, based on the best assessments of the situation at that time, were discussed with the Chief of State and his subordinates.

SCOPE AND STATUS OF INFESTATIONS

The southern pine beetle[6/] epidemic in Honduras is believed to be the most virulent and widespread on record. The scope and severity of infestations are illustrated by their spread in 18 months from a focal point in the vicinity of Gualaco throughout most of the pine stands in the central part of the country. Although spread has occurred in all directions, it has been primarily from northeast to southwest (fig. 1).

The gross area of infestations during the period from October 1962 to April 1964 amounts to about 7-1/2 million acres. The average rate of spread has been approximately 1/3 million acres monthly. However, spread during February and March 1964 was almost double the monthly average. It is estimated that the beetles may have killed some 43 million trees in the 18 months prior to April 1964. The daily rate of killing, from mid-March to mid-April 1964, is estimated at 162,000 trees, several times greater than the daily rate 6 months or a year earlier (fig. 1).

No evidence currently exists of a decrease in the virulence of the epidemic at the end of some 15 successive beetle generations. Parasites and predators, including woodpeckers, were little in evidence in the infestation areas. This apparent lack of natural control factors strongly indicates that the sustained high rate of population increase in each succeeding beetle generation has resulted in the pest species far outstripping its natural enemies, which normally would help keep infestations in check. It is not possible to predict when the epidemic will

6/ *Dendroctonus frontalis* Zimm, formerly *D. mexicanus* Hopk.

begin to wane. Thus, in the absence of a concerted control effort, the current rate of tree-killing can be expected to continue or increase.

Since the onset of the epidemic in October 1962, there has been such an overlapping of broods that the emergence of new adults and new attacks are a daily occurrence. Furthermore, since newly attacked trees emit a powerful attraction to beetles in flight, there is a strong tendency for the attacking adults to select trees adjacent to or nearby those being hit or recently attacked and killed. As a result, the heavy concentrations of attacked trees, some occurring in groups ranging up to several thousand, are extremely attractive to the beetles in flight. The newly attacked trees, in turn, are also highly attractive to the next daily lot of beetles; thus, group-kills continue to expand until whole hillsides and drainages are killed. Large numbers of beetles also are attacking trees at varying distances from old and new spot infestations. However, survey data show that a large percentage of the beetles have attacked trees in a progressive band around the large spot infestations (table 1).

The extensive area of infestations, the inaccessibility of affected stands, the rapidity of beetle development, the overlapping of beetle broods and attack of large numbers of trees daily, the shortage of trained forestry personnel, and the huge cost of felling and spraying all newly infested trees preclude the mounting of an action program with sufficient manpower and funds to achieve prompt containment and control. However, it

Table 1. Rate of Tree-Killing by Southern Pine Beetle in Active Zones of Infestation. Honduras, C. A. - April 1964.

Sample number	Gross Acres per Sample	No. of Spots of Killed Trees/Sample: Small[1]	Large[2]	Average No. of Trees per Small Spot Kill: G[3]	F[4]	R[5]	T[6]	Average No. of Trees per Large Spot Kill: G[3]	F[4]	R[5]	T[6]
1	6,400	15	25	9	12	47	68	929	265	1062	2256
2	6,400	20	32	15	26	81	124	663	277	983	1923
3	6,400	15	17	10	13	52	75	558	16	637	1211
4	6,400	4	23	26	50	128	204	884	354	910	2148
5	6,400	7	19	13	17	67	97	1278	365	1460	3103
6	6,400	5	13	7	9	35	51	559	168	631	1358
7	6,400	12	9	10	17	51	78	1112	397	1191	2700
tal	44,800	78	138	90	144	461	697	5983	1842	6874	14699
erage		11.1	19.7	12.9	20.6	65.8	99.6	854.7	263.1	982.0	2099.8
1	6,400	13	1	2	8	15	25	450	175	325	950
2	6,400	20	0	2	6	14	22	-	-	-	-
3	6,400	24	2	5	10	33	48	270	75	225	570
4	6,400	33	0	1	3	10	14	-	-	-	-
5	6,400	41	12	8	27	54	89	311	119	241	671
6	6,400	27	0	5	14	34	53	-	-	-	-
7	6,400	29	2	4	12	28	44	292	98	228	618
8	6,400	16	9	9	34	57	100	465	191	326	982
9	6,400	17	6	6	16	43	65	424	132	339	895
tal	57,600	220	32	42	130	288	460	2212	790	1684	4686
erage		24.4	3.6	4.7	14.4	32.0	51.1	245.8	87.7	187.1	520.7
1	6,400	18	0	2	1	3	6	-	-	-	-
2	6,400	23	0	6	4	7	17	-	-	-	-
3	6,400	19	0	8	5	9	22	-	-	-	-
4	6,400	12	0	8	6	11	25	-	-	-	-
5	6,400	12	0	5	4	6	15	-	-	-	-
6	6,400	10	0	3	2	3	8	-	-	-	-
otal	38,400	94	0	32	22	39	93	-	-	-	-
verage		15.7	-	5.2	6.4	6.5	15.5	-	-	-	-

[1] Small spots of killed trees - less than 200 trees per spot.
[2] Large spots of killed trees - more than 200 trees per spot.
[3] Newly infested trees - green foliage.
[4] Recently-killed trees - fading foliage.
[5] Older-killed trees - red foliage.
[6] Total infested and killed trees.

is likely that the epidemic can be slowed and the rate of tree killing thereby reduced by the following plan of operations:

1. Negotiate promptly with sawmill owners to salvage infested trees, particularly those in the large group-kills in Zones B and C. In Zone C, the salvage program should be supplemented by felling and spraying as many as possible of infested trees not salvaged. It is estimated that 30 fully equipped brigades could be effectively employed in felling and spraying infested trees not salvaged, scouting for evidence of newly attacked trees at each spot salvaged, and assisting in administration of this joint government-sawmill salvage operation.
2. Commit brigades in numbers as needed to fell and spray all infested trees within Zone D, or in areas of newly discovered spot infestations beyond the western border of the zone. Close surveillance must be maintained in the area to the west of Zone D for newly infested trees. Salvage of infested trees should be started in Zone D as soon as circumstances warrant. About 25 fully equipped brigades would be needed to fell and spray newly infested trees in Zone D. The use of powersaws, helicopter transport of men and materials, and aerial inspection of affected areas should speed control operations and reduce control costs.

The arrangement providing for prompt salvage of infested trees in Zone B and C, supplemented as needed by felling and spraying infested trees in Zone C, and similar control action in Zone D has several additional

advantages. For example, it will provide trained personnel to locate infested trees and insure their prompt salvage; it will provide for needed reinspection of salvaged spots to determine the need for further salvage; it will assign responsibility to Government employees to assist in the administration of the agreements negotiated with the sawmill owners, and to scale and record the volume of timber cut and removed from public lands, thus helping to correct trespass situations. A further advantage is that the Government and the sawmill owners will be working together to minimize timber losses. The resources of both the Government and private industry are needed to carry out an effective operation.

LOGGING, MILLING, AND UTILIZATION OF BEETLE-KILLED TREES

The southern pine beetle epidemic in Honduras started around October 1962; the time interval in which trees have been killed ranges up to 18 months. The condition of the wood in beetle-killed trees varies directly with the interval of time since death.

Most of the trees in Zone A have been dead for more than six months and all show severe blue stain, ambrosia beetle damage, and some decay. The wood in these trees is not suitable for conversion to lumber. However, the wood is suitable for use in boxing, crating, or dunnage. The stumps and butt logs are resin soaked and, if protected from fire, would be usable for 5 or more years for wood naval stores.

The trees killed in Zone B have been dead for six months or less. All are suitable for conversion to lumber, now or within a few months. Blue stain is common in all killed trees. None of those dead less than 3 months was affected by insect borers or decay. Lumber cut from all killed trees in Zone B should find a ready local market. The blue-stained sapwood will preclude export of such lumber to Europe; only light blue stain is permitted on the Caribbean market.

The trees killed in Zones C and D have been dead for less than 3 months. All can be salvaged for uses permitting blue stain. Killed trees in this zone should be salvaged and converted into lumber as promptly as possible.

According to information compiled from reliable sources, there are 87 sawmills in Honduras cutting approximately 838,000 cubic meters of logs (185 million board feet) per year. The sawmills are located primarily along the main roads and spur roads between Tegucigalpa and San Pedro Sula, and between Tegucigalpa and Catacamas. A few are located in the area between El Progreso, Yoro, and Olancha (fig. 1). All but three of the mills operate primarily on pine timber. Annual capacity of the 87 mills is as follows:

63 mills cutting less than 15,590 cubic meters of logs (less than 3 MMbm)

22 mills cutting between 15,590 and 45,300 cubic meters of logs (3 MM and 10 MMbm)

2 mills cutting more than 45,300 cubic meters of logs (10 MMbm and above)

The sawmills operate with a large labor force at costs of about 15 to 20 cents U. S. currency per man-hour. Although some mills have modern milling equipment, others are far outdated. Breakdowns are frequent, replacement parts are scarce, and there is an acute shortage of skilled mechanics for repair work. Many of the mills are operating at from 1/2 to 3/4 capacity.

Logging is primitive by most standards. Trees are felled with axes, leaving 3-foot stumps. Many mills process only the butt log, leaving more than half of the merchantable volume in the woods. The old and common practice is followed of squaring the butt logs, pointing the forward end, and drilling a hole through the pointed end to assist in skidding with oxen and rope. Crawler tractors are becoming more common on larger operations, but the bulk of all logs are skidded by animal power.

Log trucks are small and usually underpowered for the job and the roads. The average haul to the mill is only about 16 to 24 kilometers (10 to 15 miles). However, the cost per kilometer is twice as great as it should be because of poor roads. There are no paved roads and heavy layers of dust occur during most of the year.

Air seasoning of lumber is by flat piling in open cribs, flat piling in packages, end racking, and end piling. Most lumber is piled by the latter method, and by hand. During the dry season, the lumber is reduced to 14 to 18 percent moisture content in 30 to 45 days. During the winter or wet season, drying time is extended to 60 days or more.

Hauling lumber to market is the most expensive operation in lumbering. The better lumber grades, all for export, are transported to ports 80 - 120 kilometers overland on poor roads. Transportation costs average from $25.00 to $50.00 U. S. currency per 2.4 cubic meter of lumber (1,000 board feet).

Over half of the sawmill capacity in Honduras is located within, or within reasonable access to the infested timber in Zones C and D, the areas where salvage is of major importance in planned containment and control of the epidemic. The majority of wholesale lumber dealers and most sawmill operators indicated they were willing and anxious to use their logging and milling facilities in the campaign to combat the epidemic. Many of the owners and operators of the mills recognize that the salvage program will require the construction of emergency roads to remote areas, a diversion of equipment from normal operations, provision for water storage of logs for long periods, and other diversions from routine practices. Nevertheless, all lumbermen express a desire to negotiate with the Government and to pursue the campaign against the beetle before all the trees are killed.

On the basis of careful appraisal of the resource, the following suggestions are offered to help remedy the problem:

The sawmill owners should:

1. Divert logging to the infested areas in Zones B and C as soon as possible. The diversion of logging will include construction of truck trails to the proximity of all large spots of infestation.

2. Make needed arrangements to cold-deck salvaged logs in excess of mill capacity, and cover them with a continuous water spray to prevent degrade from insects and diseases.
3. Give to the Government no less than 30 percent of all lumber of lowest grade from trees cut in salvage operations. All such lumber should be well-manufactured, edged and trimmed, dipped in antistain chemicals, and delivered to designated storage yards.

The Government should:

1. Provide an average of one fully equipped brigade at each cooperating sawmill for felling and spraying infested trees not salvaged, and for related duties as outlined above.
2. Waive stumpage fees and municipal charges in return for the 30 percent of sawn lumber. In addition, allowance should be made for the cutting of 100,000 board feet of timber per mile of road constructed, inclusive of all killed-trees salvaged.
3. Establish storage yards to keep sawn lumber received from sawmills. There should be provision to guard the stored lumber against pilferage or other loss. Lumber received at storage yards could be used by the Government in rural and urban development programs for schools, hospitals, municipal buildings, bridges, and housing. Sawn lumber might also find a ready market locally and in the Caribbean area.

FOREST INDUSTRY POTENTIAL

Forest and agricultural products account for approximately 50 percent of the gross national product of Honduras. They also account for about 90 percent of all exports and provide gainful employment for approximately three-fourths of the total labor force. The pine and hardwood forests of the country have not been fully exploited. Despite the current depredation caused by the southern pine beetle, the pine resource retains high values and is a source of great potential wealth. Many types of wood-using industries would fit into the Honduran economy and each would contribute to raising the economic standard of the country. Each new forest industry development would create a demand for common and skilled labor. A few of the more desirable wood-using industries which would contribute greatly to the Honduran economy are discussed below.

Urban and Rural Housing. The pine and hardwood forests of Honduras are a ready source for lumber urgently needed for urban and rural housing throughout the country. To attract firms and companies dealing in wood housing, together with architects and engineers acquainted with modern low-cost construction methods, modular design, standard-sized units, preservation treatment, judicious combinations of wood and ceramics, wood and plastics, wood and metal, and wood with other products, will require close cooperation between sawmills and Government. At present, the sawmills are experiencing great difficulty in the profitable disposal of lower grades of lumber. Since the lower grades would be used extensively in large scale urban and rural housing, the Government could

arrange to exchange public stumpage for sawn lumber and thus provide the material for "stepping-up" its housing program.

Pulp and Paper. The pine forests of Honduras, now and in years to come, could readily supply wood fiber in quantities needed for pulp and paper industries. Other factors also favor the development of a pulp and paper industry. For example, there is an adequate supply of good water from several rivers. There is also an approximate 20-year reserved supply of pine, a vast supply of hardwood timber, and large acreages with site quality capable of short-term regeneration of pulpwood timber.

All sawmills currently are disposing of their wood waste by burning. With suitable transportation facilities, these mills should be able to supply no less than 50,000 tons of solid wood residue or wood chips to a pulp and paper mill year in and year out. Furthermore, since current logging practices leave the upper half or two-thirds of each cut tree in the woods, capture of this waste would add greatly to the supply of fiber needed at a pulp or paper processing plant.

Most pine timber and hardwood stands suitable for pulping are far from coastal ports. Therefore, a major requisite to a pulp and paper industry in Honduras is suitable access roads from timber stands to millsites to coastal ports.

Hardwood Processing. Hardwood plants, using wet or dry processes, would utilize types and quantities of raw materials similar to those used by pulp and paper mills. However, an economical hardboard plant can be of much smaller size, and thus be established with a smaller capital

investment. Hardboard is used extensively in the building trade in Central and South America; the potential market for the product should be excellent.

Plywood Plants. The manufacture of plywood from hardwood and pine offers excellent opportunities in Honduras. Plywood processing plants would likely be clustered along the north coast, in proximity to large acreages of hardwoods, and not far from suitable stands of pines. Such plants could manufacture a variety of products, ranging from lower-grade material for home consumption to high-grade plywood for export. Such plants could also produce fancy veneer or structural grade material in competition with Douglas-fir plywood.

Boxes, Crates, Baskets, and Pallets. The export of fruits, vegetables, canned goods, and other commodities from Honduras creates a large demand for such items as boxes, crates, baskets, and pallets. These can be manufactured with ease from low-grade pine or hardwood in solid or veneer form. Furthermore, the requirements for machinery and skills for their manufacture are not exacting; thus, capital outlay for their production would not be great.

Furniture. There is a marked scarcity of furniture manufacturing in Honduras despite a strong demand for furniture and an amply supply of high quality furniture wood. The rapid rate of population increase in Central and South America and the expansion of urban and rural housing should create an ample market for furniture products.

Charcoal. Currently, there is a budding interest in exploiting a large deposit of low-grade iron ore in Honduras. Such exploitation will require large quantities of charcoal. Beehive charcoal kilns are an excellent source of income to rural families and this should not be overlooked in planning for the use of wood resources in the vicinity of processing plants.

ACCESS ROADS

The lack of a suitable network of roads in Honduras is believed to be one of the major deterrents to the establishment or expansion of wood-using industries in the country. Currently, only two short stretches of roads are paved. There is urgent need to provide good access to all timbered areas. This would include improving the road between the Capital north to San Pedro Sula and northeast to Catacamas, and reconstructing a cross country highway from El Progresso through Yoro to Olanchito. High priority should be given to constructing an access road between Puerto Castillo and Catacamas.

SUGGESTED FORESTRY PROGRAM

A rough estimate was made by air to give an approximation of what losses may have occurred in timber volumes in the infested zones. By assessing the proportion of dead crowns to live crowns in areas affected by the southern pine beetle, and by assuming that crown cover in affected areas occurred primarily in pole and sawtimber size trees, it is estimated that as much as 50 percent of the gross volume of timber may have been

killed during an 18-month period in relatively inactive infestation Zone A (fig. 1). However, despite this heavy depredation, a significant and important volume of live timber remains. Additionally, there is a rapid growth in trees of all sizes; thus, a large increment of wood is occurring annually. Assuming no further material loss from insects, the affected areas have considerable promise for successful forest industry operations if suitable roads are built in the infested zones and forest fires are controlled to permit natural regeneration.

Currently, new farmers and others are clear-cutting and burning large acreages of nonagricultural lands. This malpractice is seriously threatening the future of the extensive pine forests and severely degrading the status of legitimate farming. The fertility and stability of the soil constitutes a main source of wealth for the country and it is essential that it be adequately protected.

Honduras is a mountainous country and steep terrain limits the acreage of land suitable for continuous agriculture. It has been estimated that only 40 percent of the land in Honduras should be devoted to agriculture and the remainder to forest crops in order to provide reasonable levels of prosperity for future generations. By means of soils studies now underway throughout Honduras, it should be possible to demonstrate the desirability of restricting cultivation of lands to the more fertile areas in valleys and in gently rolling terrain. Restrictions in uses of land for cultivated crops and grazing could be brought about by implementing planned rural development programs and other similar Government-sponsored projects.

The establishment of a sound and well-planned Forest Service in Honduras is indispensable in the orderly protection, regeneration, and utilization of the country's forest resources. Such a service, functioning as a part of the permanent national government structure, could aid the Minister of Natural Resources in achieving the institutional development and coordination needed for wise management of the forest wealth of the country. For example, efforts should be made to create and maintain a healthy environment for private investment and to develop guidelines and procedures for carrying out established policies. The construction of standard grade forest access roads is also a prime necessity and this function should also be a responsibility of the government Forest Service organization.

The Government-planned rural development program contemplates the construction of a series of farm-to-market roads in currently isolated but potentially rich agriculture, livestock, and forestry areas not now incorporated into the productive area of the country. The linking of these rural areas and the rapid movement of farm and forest products to world markets would materially aid the development of the country and fully utilize current and potential resources. Access forest roads should be coordinated with planned farm-to-market roads to make certain that all vital forest areas are quickly accessible for the suppression of forest fires.

Ranking high in priority in the development of a forestry program in Honduras is the provision to protect forest resources against destructive agents. It is especially important to provide for the control of

fire, with high priority given to areas seriously affected by the beetles. Uncontrolled fire in stands laid waste by the epidemic would totally destroy the areas and leave the land barren and wholly unproductive. An adequate fire control program is most urgent to protect reproduction and residual green timber available to present industry, and as insurance to attract new industrial developments. A forest-protection program should provide means for early detection and prompt suppression of destructive insects and diseases.

The implementation of an effective fire control program in Honduras will not be easy. The Government Air Force operates a fleet of light aircraft and has a number of highly competent pilots. The country has a well-developed air-strip network. Active participation by the Air Force in a Civic Action fire control program could contribute greatly in securing an adequate protection level. The use of light aircraft for fire detection, and helicopters for transporting men, equipment and supplies, would result in a highly mobile and effective striking force for fire control. The use of parachute troops trained as "Smokejumpers" would also be an effective Civic Action project.

The two all-purpose helicopters recently made available to the Honduran Air Force are ideally suited for quick transport of mobile fire control forces to any spot in the country. By developing an effective fire dispatching headquarters and arranging for the strategic deployment of men, equipment, and supplies, quick and effective action could be taken to suppress forest fires. Assistance in the operational aspects of a

forest fire control program, including a strong and effective information and education program might be furthered by enlisting support of Peace Corps foresters. All phases of a forest fire prevention and control program should be fully coordinated with the bilateral agreement for fire control between Germany and Honduras.

Major effort should be made by Honduran officials to attract foreign capital for the development of forest products processing industries. There are many such opportunities. With each new wood-using industry there will be increased employment, government revenue from sale of timber, and export earnings. It is also suggested that provision be made to establish a library center of forestry information. Such a center would serve for studies of needed legislation and fiscal amendments to forest laws. It would also permit studies to determine priorities of special forestry programs, such as watershed protection; naval stores potential; teak, mahogany, and rubber plantations; and restoration of denuded areas with pine species.

FORESTRY TRAINING

There is urgent need for a several-fold increase in the number of professional and practical foresters in Honduras. Both types of men are needed to carry out the suggested forestry programs, particularly the parts prescribing forest protection, regeneration, and utilization of the total forest resource. Preparing men for these jobs can be accomplished by establishing a vocational school at the Catacamas Vocational Agricultural College and by arranging for selected students to receive

professional training in the United States.

FOREST LAWS

A review was made of the laws of Honduras (Decreto Numero 117) applicable to the vegetation, fauna, water, and soils of the forest area. These laws are well prepared and inclusive. The Articles on disease and insect epidemics give the Forestry Department broad authority for control action on all levels including land privately owned.

It is suggested that authority be given to the Government to receive a percentage of the lumber production in lieu of stumpage payments for timber cut from public lands.

GPO 878.946

FIGURE 1

HONDURAS
CENTRAL AMERICA

SOUTHERN PINE BEETLE EPIDEMIC

LEGEND

- INITIAL INFESTATION – OCTOBER 1962
- STATUS OF INFESTATION – APRIL 1963
- PRIMARY DIRECTION OF SPREAD
- WESTERN EDGE OF INFESTATION – FEBRUARY 1964
- WESTERN EDGE OF INFESTATION – APRIL 1964

SAWMILLS

- Produces over 10 million board feet per year
- Produces 3 to 10 million board feet per year
- Produces less than 3 million board feet per year

SCOPE AND STATUS OF BEETLE EPIDEMIC

ZONE	NET ACRES	NUMBER OF TREES KILLED				DAILY RATE OF TREE KILLING
		GREENS	FADERS	REDS	TOTAL	
A	1,939,500	NIL – INACTIVE ZONE			33,940,000	NIL
B	944,400	2,643,300	979,800	3,208,100	6,831,200	120,700
C	790,200	881,100	326,600	1,069,300	2,277,000	40,200
D	885,900	19,000	13,200	22,600	54,800	1,100
TOTAL ACTIVE ZONES	2,620,500	3,543,400	1,319,600	4,300,000	9,163,000	162,000
TOTAL ALL ZONES	4,560,000	—	—	—	43,103,000	—

SCALE
0 5 10 20 30 50 KILOMETERS

APRIL 1964